

(12) UK Patent Application (19) GB (11) 2 382 386 (13) A

(43) Date of A Publication 28.05.2003

(21) Application No 0128281.3

(22) Date of Filing 26.11.2001

(71) Applicant(s)
NSK Steering Systems Europe Limited
(Incorporated in the United Kingdom)
Belmont Place, Belmont Road,
MAIDENHEAD, Berkshire, SL6 6TB,
United Kingdom

(72) Inventor(s)
James Peter Bentley

(74) Agent and/or Address for Service
Raworth Moss & Cook
Raworth House, 36 Sydenham Road,
CROYDON, Surrey, CR0 2EF,
United Kingdom

(51) INT CL⁷
F16C 25/08 // F16C 41/02

(52) UK CL (Edition V)
F2A A5B6
U1S S1850

(56) Documents Cited
GB 2255598 A **JP 090032861 A**

(58) Field of Search
UK CL (Edition T) **F2A AD10 AD14 AD16 AD19 AD26**
AD32 AD68 AD72
INT CL⁷ **F16C 25/00 25/02 25/04 25/06 25/08 27/00 27/02**
27/04 27/06 27/08 35/00 35/02 35/04 35/06 35/07 35/08
35/10 35/12 41/00, F16D 1/00 7/00
Other: **Online: EPODOC, WPI, PAJ & OPTICS.**

(54) Abstract Title
Tolerance take-up member

(57) A tolerance take-up member for a bearing of a steering column assembly, for example, comprises two substantially annular parts 1, 3, one of the parts being inset in the other and protruding from it and being provided with a taper 5 to fit between one member such as a tube or shaft 7 and another member such as the bearing 9. Means by which the tolerance take-up member is held onto tube or shaft 7 may include a circlip 11, a snap-fit lug/rib (13, Fig 4) or an annular disc (14, Fig 5); each positioned with regards annular groove 12.

The two parts 1,3 can be made of different materials and preferably are moulded out of plastics material of different hardnesses and/or resiliences, such as acetal (polyoxymethylene) resins and/or thermoplastic elastomers.

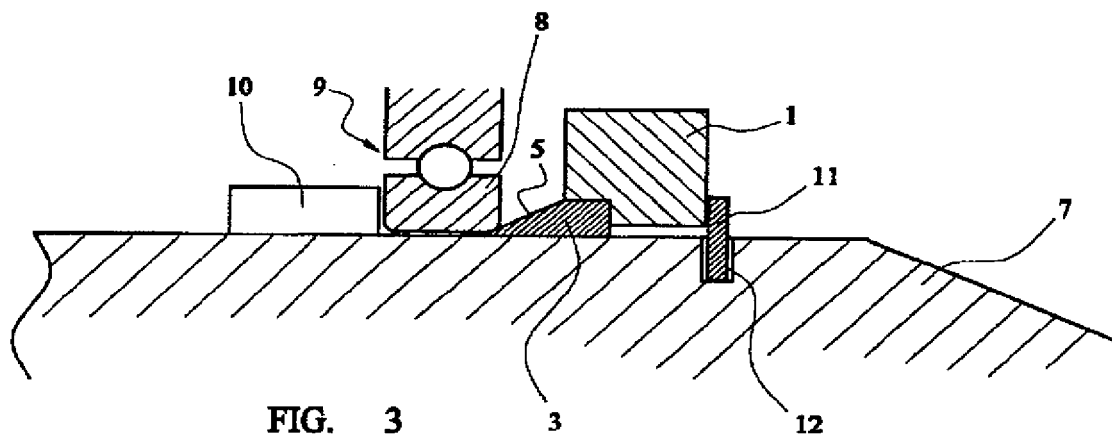


FIG. 3

GB 2 382 386 A

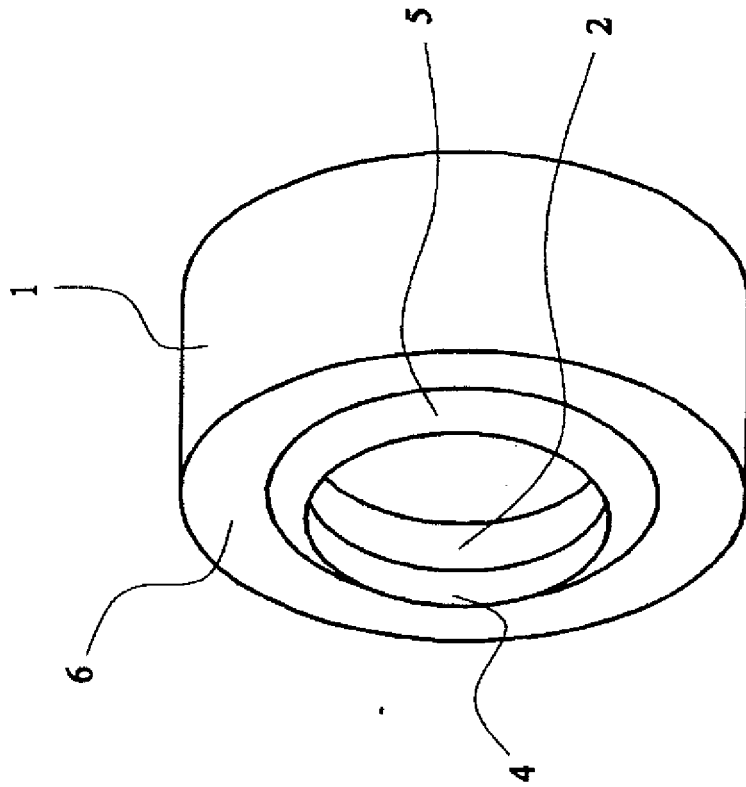


FIG. 1

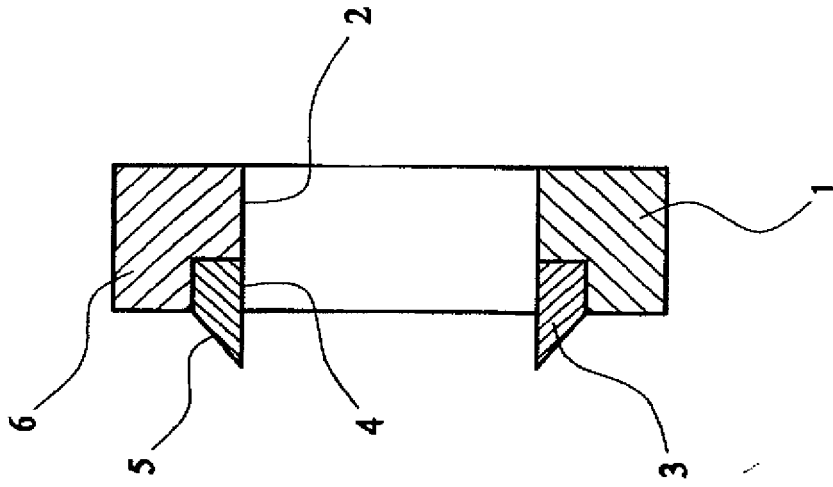


FIG. 2

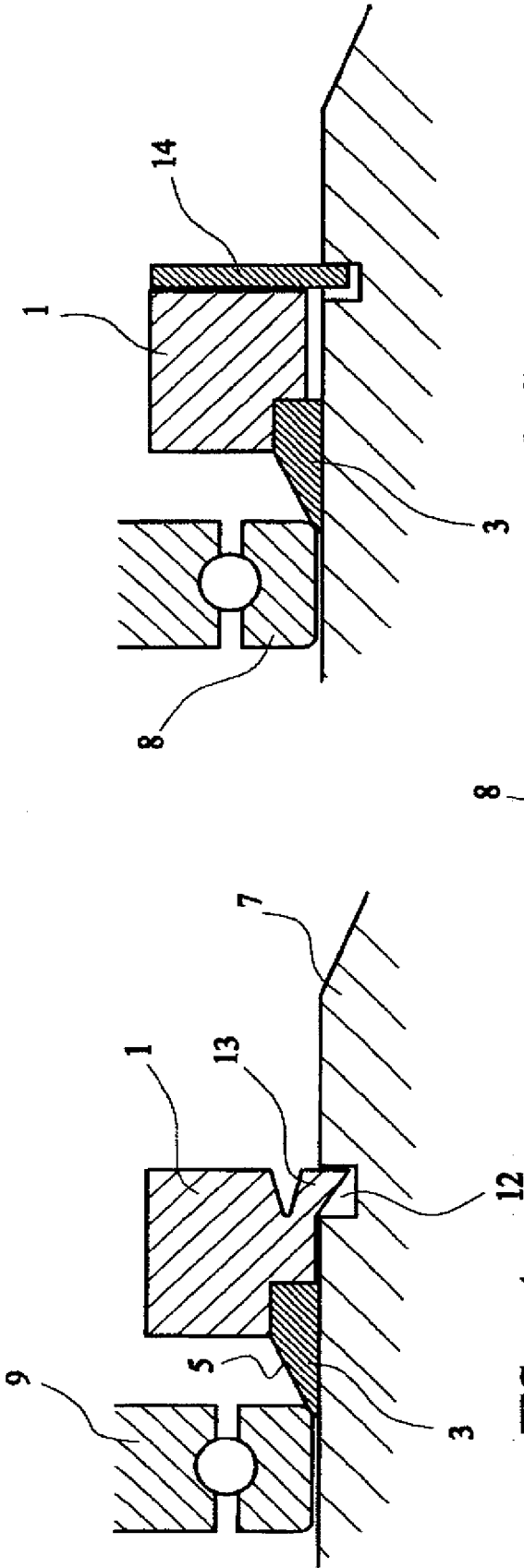


FIG. 3

FIG. 4

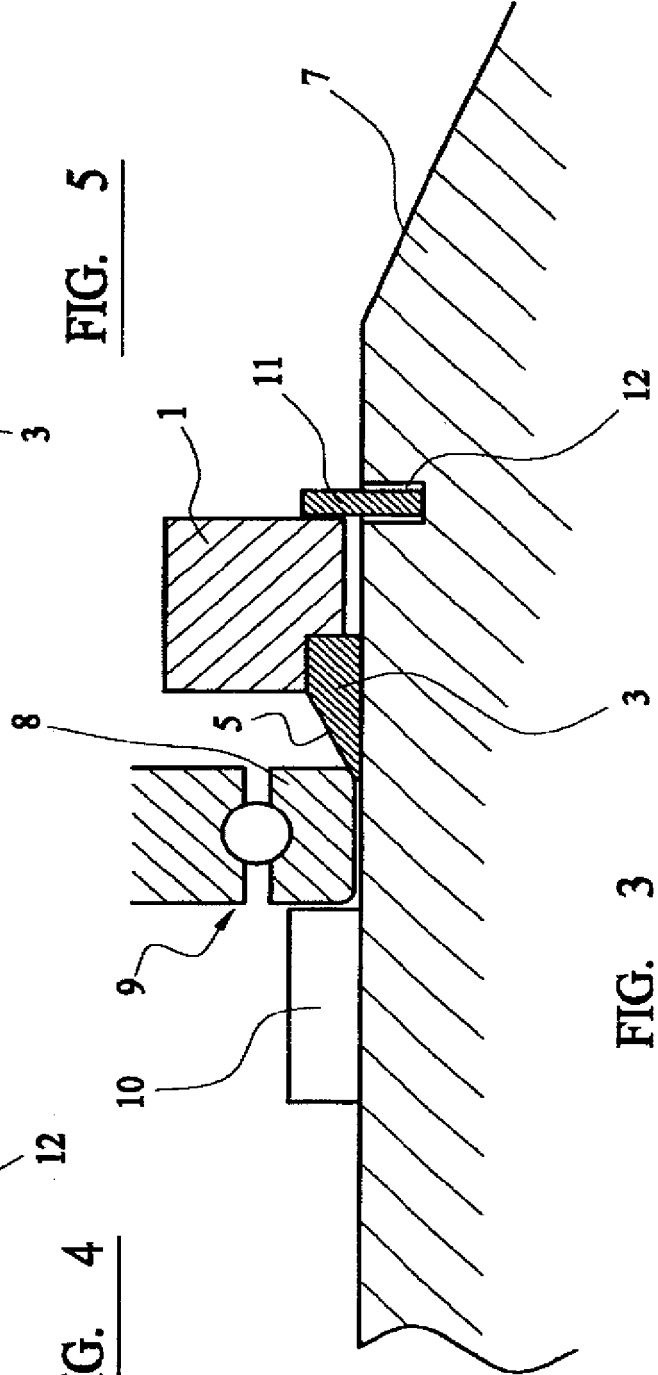


FIG. 5

TOLERANCE TAKE-UP MEMBER

5 This invention relates to a tolerance take-up member of a type that, for example, can be mounted on a tube or shaft in order to take up tolerance between the tube or shaft and another member such as a bearing.

10 It is known for bearings to be mounted on shafts with a clearance fit, being located up against a locking collar. Axial clearance can be absorbed by use of axial thrust washers whilst the bearing can be maintained in position on the shaft by axial load when a circlip is fitted. However, this can produce noise problems in a working environment and solutions such as closing the gap
15 causing the noise by filling it with resin.

20 According to the present invention, there is provided a tolerance take-up member, comprising two substantially annular parts, one of the parts forming a body part of the member and the second part being inset in the body part and protruding from it, and the protruding portion of the second part being provided with a taper to fit between one member and another member, thereby to take up tolerance therebetween.

25 The two parts may be of two different materials. Each material may be a plastics material. One of the materials may be a hard plastics whilst the other material may be of a more resilient nature.
30 Alternatively, the material of the first part may be of a softer resilient plastics material whilst the second part can be of a harder plastics material. The second part may be made of the plastics material of the more resilient nature. The former material may be an acetal

resin (polyoxymethylene resin). The more resilient material may be a thermoplastics elastomer. The member may be totally annular. An inner bore of the member allows for the member to be fitted about a tube or shaft.

5

Each part may have an inner surface that faces the tube or shaft when mounted on it. Each of these surfaces may be annular. The diameter of the annular surface of the first part may be greater than the diameter of the annular surface of the second part. The diameter of the inner annular surface of the second part may be constant. Accordingly, the taper of the second part commences from a point where it leaves the first part towards a ring point forming the extremity of the protruding portion of the second part.

10

15

The tolerance take-up member may be provided with a device to hold it in place on a tube or shaft. The device may be integral with the tolerance take-up member. The device may be joined to the first part of the tolerance take-up member and may be of a different material to the material of the first part. Another possibility is for the device to be in the form of a circlip for holding the tolerance take-up member in place in reaction to the other member whose tolerance is to be taken up.

20

25

The invention also extends to a tolerance take-up member when mounted on a shaft or tube.

30

The other member whose tolerance is to be taken up may be a bearing. The bearing may be located in place on the tube or shaft by a shoulder of a key lock collar.

The tolerance take-up member can be formed by moulding. With the two or more different materials, the moulding process can be a multi-shot moulding process.

5 The invention also extends to a steering column assembly for a vehicle incorporating a tolerance take-up member as essentially defined above.

10 For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

15 Fig. 1 is a diagrammatic perspective view of a tolerance take-up member;

 Fig. 2 is a sectional view of the tolerance take-up member of Fig. 1;

20 Fig. 3 is a sectional view of the tolerance take-up member of Figs. 1 and 2, shown mounted on a tube or shaft, for example;

25 Fig. 4 is a sectional view illustrating a second embodiment; and

 Fig. 5 is a view similar to Fig. 4 illustrating a third embodiment.

30 Figs. 1 and 2 show an annular tolerance take-up member of plastics material having a main body part 1 with a cylindrical bore 2 and an inset body part 3 also provided with a cylindrical bore 4. The inset part 3 has a portion 5 that protrudes from an end face 6 of the main

body part 1 and tapers to a ring point at, for example, an angle of 35° to the cylindrical bore 4.

5 The main body part 1 may be made of a hard plastics material such as an acetal resin and the inset part may be made of a thermoplastics elastomer.

10 As shown in Fig. 3, the tolerance take-up member is fitted about a tube or a shaft 7, for example, to take up tolerance between an inner ring 8 of a bearing 9 and the tube or shaft 7.

15 The bearing 9 is axially loaded against a shoulder of a key lock collar 10 that is fitted about the tube or shaft 7. The taper ring portion 5 of the tolerance take-up member is urged between any gap existing between the inner surface of the inner ring 8 of the bearing 9 and the outer surface of the tube or shaft 7, using the inherent resilience of the tolerance take-up member and is held loaded against the bearing 9 by means such as a
20 circlip 11 mounted in an annular groove 12 in the tube or shaft 7.

25 Using the moulding technique, the tolerance take-up member can be, in the case of the embodiment shown in Figs. 1 to 3, a twin-shot, single-piece moulding.

30 Fig. 4 shows another embodiment, where the need for a separate circlip is eliminated by providing another form of device for loading the tolerance take-up member against the bearing 9. As shown in Fig. 4, the main body part 2 of the tolerance take-up member is provided with a resilient lug or rib 13 that effectively reduces the inner diameter 2 of the bore of the part 1, so that, as

the tolerance take-up member is loaded against the bearing 9, the lug or rib 13 snap fits into the annular groove 12 on the tube or shaft.

5 Fig. 5 shows another variation, that is similar to Fig. 4 but where a separate device is bonded to the main body part 1 and is in the form of an annular disc 14 joined to the end face of the body part 1 remote from the end face from which tapering part 3 protrudes. The part
10 3 and the part 14 may be of the same material and, as an illustration, can be of a hard plastics material, whilst the main body part 1 can be of a more resilient or rubber-like plastics material.

15 In all cases, the hardness and material of the plastics can be adjusted to suit the particular application of the tolerance take-up member.

 It will be appreciated that the present tolerance
20 take-up member can take up radial and/or axial clearance on, for example a vehicle steering column to avoid unwanted noise.

CLAIMS

1. A tolerance take-up member, comprising two substantially annular parts, one of the parts forming a body part of the member and the second part being inset in the body part and protruding from it, and the protruding portion of the second part being provided with a taper to fit between one member and another member, thereby to take up tolerance therebetween.

10

2. A tolerance take-up member according to claim 1, wherein the two parts are of two different materials.

15

3. A tolerance take-up member according to claim 2, wherein each material is a plastics material.

20

4. A tolerance take-up member according to claim 2 or 3, wherein the two materials have different hardnesses and/or resiliences.

25

5. A tolerance take-up member according to any one of the preceding claims and being totally annular.

6. A tolerance take-up member according to any one of the preceding claims, wherein each part has a surface that faces a tube or shaft when mounted on it.

30

7. A tolerance take-up member according to claim 6, wherein each surface is annular.

8. A tolerance take-up member according to claim 7, wherein the diameter of the annular surface of the first part is great that the diameter of the annular surface of the second part.

9. A tolerance take-up member according to claim 7 or 8, wherein the diameter of the inner annular surface of the second part is constant.

5 10. A tolerance take-up member according to any one of the preceding claims, and being provided with a device to hold it in place on a tube or shaft.

10 11. A tolerance take-up member according to claim 10, wherein the device is integral with the tolerance take up member.

15 12. A tolerance take-up member according to claim 10, wherein the device is a circlip for holding the tolerance take-up member in place in reaction to the other member whose tolerance is to be taken up.

20 13. A tolerance take-up member according to any one of the preceding claims and being formed by moulding.

25 14. A tolerance take-up member, substantially as hereinbefore described, with reference to Figures 1 to 3, with or without the modification of Figure 4 or Figure 5 of the accompanying drawings.

15. A tolerance take-up member according to any one of the preceding claims, when mounted on a shaft or tube.

30 16. A steering column assembly for a vehicle incorporating a tolerance take-up member according to any one of the preceding claims.

17. An assembly according to claim 16, wherein said other member whose tolerance is to be taken up is a bearing for locating in place on a tube or shaft of the steering column assembly.



INVESTOR IN PEOPLE

Application No: GB 0128281.3
Claims searched: 1 - 17

- 9 - Examiner: David J Evans
Date of search: 22 May 2002

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): F2A (AD10, AD14, AD16, AD19, AD26, AD32, AD68, AD72)

Int Cl (Ed.7): F16C (25/00, 25/02, 25/04, 25/06, 25/08, 27/00, 27/02, 27/04, 27/06, 27/08, 35/00, 35/02, 35/04, 35/06, 35/07, 35/08, 35/10, 35/12, 41/00);
F16D (1/00, 7/00)

Other: Online: EPODOC, WPI, PAJ & OPTICS.

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2255598 A (INA WALZLAGER SCHAEFFLER KG)	-
A	JP 9032861 A (KOYO SEIKO CO) see figs 1-3 and abstract translation.	-

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.

& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.